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ABSTRACT

Correlates that describe in part the variation of conditions under which learning is attempted are discussed. Each of these correlates is significantly related to student achievement. Categories into which the correlates are grouped are: Socioeconomic Status Variables (mother's occupation, father's occupation, mother's educational level, father's educational level, value of home, and household income); Teacher Variables (teacher's experience, teacher's salary, teacher's certification, student orientation in contrast to "subject" orientation, verbal facility, recency of training and level of education, and job satisfaction--teacher turnover); and School Variables (school site size, building age, percent substandard classrooms, library volumes per student, textbooks per student, school size, student mobility, class size, number of special area teachers per student--lab facilities, average teacher time in guidance, length of school year, and materials and supplies expenditures). (DB)

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The Use of Correlates of Achievement in Statewide Assessment

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It is generally recognized, that to consider the results of student achievement measures without taking into account the conditions of learning, frequently leads to inappropriate interpretation of the results and misguided action. A logical strategy to prevent these adverse effects is a systematic analysis of the conditions under which learning is attempted, and the resources which are brought to bear on the learning attempt. In addition, direct consideration of condition variables is the first step in defining hypotheses about the causes of learning success or failure.

To accomplish this analysis, a two stage model of assessment activity is recommended. In the first stage, data on both condition variables and student achievement should be systematically collected in such a manner that some competing explanations of the results are ruled out while others remain plausible. These data are statewide in origin, with comparisons available on specific conditions in contrast to specific organizations.

A careful analysis of the relationships which are found in the first stage is the basis for more intensive smaller scale studies. At this level the unit of consideration moves from statewide data collection to an individual learning unit study.

The methods for doing the large scale data collecting and analyzing are illustrated by a number of studies and reviews which have been undertaken in recent years. Several of these studies have been selected because the variables they examined included those which share common variance with student achievement to an extent which suggests that fruitful causal hypotheses may be generated about the situations which these indicators or correlates

describe. In none of these studies has the second stage been undertaken. Table 1 shows frequently occurring correlates which describe in part the variation of conditions under which learning is attempted.

TABLE I.

Socioeconomic status variables

- Mother's occupation
- Father's occupation
- Mother's educational level
- Father's educational level
- Value of home
- Household income

Teacher variables

- Teacher's experience
- Teacher's salary
- Teacher's certification
- Student orientation in contrast to "subject" orientation
- Verbal facility
- Recency of training and level of education
- Job satisfaction - teacher turnover

School variables

- School site size
- Building age
- Percent substandard classrooms
- Library volumes per student
- Textbooks per student
- School size
- Student mobility
- Class size
- Number of special area teachers per student - lab facilities
- Average teacher time in guidance
- Length of school year
- Materials and supplies expenditures

Each of these correlates is significantly related to student achievement, defined as some measure of verbal or mathematical performance, in one or more studies. To facilitate discussion they have been grouped in broad categories.

Socioeconomic Status Variables

The first group, socioeconomic status (SES) variables, shows a positive, strong relation to achievement in every one of the studies reviewed in which they were considered (Benson, 1965; Burkhead, 1967; Campbell, 1971; Coleman, 1966; Dunnell, 1971; Garon, 1971; and Kiesling, 1968). The methods of collecting such data vary from student questionnaires to estimates from census data. In many cases there is strong reliance upon school records or school officials' opinions about the socioeconomic status of the neighborhood. The definition of the variable also ranges from family income through occupation to housing quality and parents' education. Regardless of the grossness of the measure, the positive relationship exists.

The important issue, however, is the interpretation of these findings. They do not establish that low or high SES is a cause of low or high student achievement. The SES variables are at best proxies for some set of experiences the student has had and through which he has developed his own unique coping style. More specific analysis of the factors associated with SES are illustrated in the work of Shipman (1971) on the mother-child interaction tasks. Her study suggests that language utilization patterns, which vary with SES, may be significant mediators of the learning experience. Another hypothesis is evoked by an unpublished study conducted by the author in 1970 of several very small high schools. Among these schools, the correlation between SES and achievement was nonsignificant. This study suggests that SES is not important where it does not have the effect of sorting the student body into social strata. In these schools the small size of each grade seemed to limit the range of differential experiences of the students.

The data from SES studies in general suggest that qualitative differences in teacher-student-interactions across the levels of SES are the most useful places to look for causes of variability in student achievement. These data also indicate, spanning as they appear to do the whole variety of educational experiences, that the causes of insufficient learning will not be easily found nor will solutions be quickly implemented. In pursuing the elusive causes of achievement variability, therefore, it is suggested that data on those forms of the SES variable which have the most direct relationship to the student's educational experiences, such as parents' education and allocation of community wealth to the educational enterprise, should be collected where possible.

Teacher Variables

The next group of variables which appear to relate to achievement are teacher related. They include training, experience, morale, salary, verbal facility and attitude toward students. In general, although the relationship was much lower than the SES variables, teacher variables were reported significant in most of the studies (Benson, 1965; Burkhead, 1967; Campbell, 1971; Coleman, 1966; Goodman, 1959; Guthrie, 1971; Hanushek, 1968; James, 1963; and Kiesling, 1968). It is rare, however, for these variables to account for more than 10 per cent of the student achievement variance. Three studies provide clues for possible causal hypotheses about teacher effects. Guthrie (1971) found verbal ability and job satisfaction to be significantly related to student achievement in a positive direction. Hanushek found a significant positive relation between the recency of teacher training in subject areas and the achievement variables. This training was not of the usual undergraduate type, but rather that acquired through facilities such as NDEA institutes. Kiesling (1968) likewise notes the

negative effect of teacher turnover on student achievement. These data suggest that a teacher with up-to-date training in the subject matter he is teaching, who can communicate well with the students, and is basically role satisfied, will best augment the educational experience of the students as measured by achievement tests.

School Facilities Variables

The final set of variables considered in this paper are those related to school facilities, broadly defined. They include physical characteristics such as building site size and building age. They also include arrangements which influence how teachers spend their time and characteristics which affect the school climate such as student independence or restrictions. This set of variables, like the teacher set, does not in general reach the strength of relationships found between student achievement and the SES variables. The results for school facilities variables are also less consistent from one study to another. Class size, for example, is sometimes positively and sometimes negatively related to student achievement. Of the thirteen studies reviewed, this variable was positive in four (Burkhead, 1967; Flanagan, 1962; Guthrie, 1959 and Shipman, 1971) negative in one (Dunnell, 1971) and did not achieve significance in the remaining eight. The variables of greater interest in this set are those which suggest a kind or quality of interaction between the student and his learning environment (including the teacher). A review of the commonly examined variables does not reveal any good candidates for this specification. Therefore, it is probably more profitable to relegate these variables to a secondary order, to be considered only as they enhance or hinder the operations of the most important set - the learning variables.*

*The reader is urged to read the informative paper by Kiesling, (1971) for a more detailed discussion of the condition variables and their analysis.

Process Variables

It is readily apparent that the correlates of achievement described in the preceding section are, at best, proxy or carrier variables which are not likely in themselves to be causative antecendents. It is also apparent that many such variables are not subject to alteration by the school. The alternative for achievement improvement is therefore to be found in the process of education - those things which occur within the school's sphere of influence. This means the interaction among the teachers and students, with or without tangible materials as part of the setting, must be examined.

It is sometimes useful to classify processes according to function. Managerial or facilitative processes are those which bring about a setting in which an interaction can occur, e.g., reducing class size, building open classrooms, organizing modular scheduling and providing elementary guidance personnel. They are a set of variables which frequently overlap the earlier defined school facilities, but which may be more specifically directed toward programs which reflect the school's philosophy.

Learning processes, on the other hand, are those interactions which occur within the setting provided by the facilitative process and which involve the student directly. If, for example, the objective is learning to recognize the sense of a simple paragraph, a set of events must occur. The student must recognize most or all of the words. If he does not recognize all the words, he must be able to infer the meaning of the unknown from the known. He must select or infer the appropriate meaning of known words from the context, and finally, he must understand the relationships among the words. It is probable that he does this by finding much that is familiar, enough new material to maintain his interest, and the thread of an idea that he wants to bring to closure. The teacher may interact in this learning

situation by providing an "other person" model of interest in the idea. This role is best fulfilled by being genuinely enthusiastic, although a sincere interest in the learner may suffice. The teacher must also be sensitive to the ratio of the known to the unknown, and must keep the unknown to a manageable level through the medium of providing the student with necessary information. In order to achieve this sensitivity, the teacher must be aware of the practices within the community which determine the meaning of certain behaviors, both verbal and physical (in the "body english" sense), and must be able to practice the necessary communication skills to convey and receive messages to and from the student. The acceptability and utility of such communication characteristics as level of voice (loud-soft) and choice of words (shut up - please be quiet) need to be understood. Finally, the teacher must provide reinforcement through reassurance on tentative but appropriate responses of the student.

Although much attention has been given to the teaching task, little is positively known about the nature of effective teacher-student interaction. It is here, to be functional, that assessment must make a contribution.

The documentation of teacher-student interaction and the analysis of its relation to student achievement is difficult, time consuming and expensive. Although a number of observational techniques are available, (see Flanders, 1966 and Medley, 1968), it is unlikely that such intensive observation procedures can be adapted to large scale collections of data for statewide assessment purposes. However, statewide assessment offers a unique opportunity for examination of learning processes if a two stage model is adopted.

In the first stage of this model data are collected on student achievement and the condition variables of interest. The student achievement data are classified according to the levels or categories of the most explanatory correlates. In the second stage a smaller sample of two types of classrooms within each classification, one markedly successful and the other markedly less so, are selected for intensive study.

TABLE II.

Stage I

- Collect data on student achievement
- Collect data on condition variables
- Analyze the relationship of the two sets of data
- Classify achievement data by levels or categories of selected correlates

Stage II

- Select sample of classrooms from extremes within classifications
- Conduct intensive study of classroom interactions
- Collect data
  - Task card sort
  - Teacher questionnaire
  - Student questionnaire
  - Question formulating and alternative descriptions test
  - Teacher group interview

Under the assumption that effective teacher-student interaction may be mediated by the teacher's perception of the students as learners, the students' perception of the teachers as sources of information and support, the communication skills of the teacher, and the actual activities in which the group engages, five types of data collection are proposed. These are a card sort of classroom activities, a teacher questionnaire designed to assess empathy with students, a student questionnaire on perception of the teacher, a teacher test of ability to formulate questions and to explain concepts in a variety of ways, and a structured group interview directed toward sensitivity to student needs.

The card sort device is used to provide a profile of the actual activities which go on in the classroom over time. Its development consists of three steps. First a group of teachers is selected from the population of interest. For the purposes described here this population would be teachers from each type of school which is a candidate for intensive study. These teachers are contracted to provide a list of the activities in which they engage on a random selection of days. The activities may range from teaching consonant blends to scolding the class for making too much noise. After this collection is complete, the activities are edited for overlap and clarity, and printed on cards, one activity per card. The card sets are then reviewed for representativeness by another sample of teachers from similar schools, with the additions and deletions recommended by this group carefully considered. A preliminary analysis of activity differences between the types of schools may be conducted at this stage. This analysis can suggest possible interaction differences for further exploration. The principal data collection, however, secures from a new sample of teachers working in the intensive study schools a profile of activities they perceive to be occurring. These teachers, on a random sample of days, sort the cards into two sets; those activities which they did on the day in question and those which they did not do. The cards are then tabulated by a clerk and retained until the next sample day arrives. New activities, as they occur, can be recorded by the teacher on blank cards included each time in the deck. The relative frequency and the nature of the activities provides a picture of the common modes of operation in each type of school.

Such data must be supplemented by additional information. The teacher empathy questionnaire assists in this function by providing an assessment

of the teacher's perception of her class. A series of statements, covering a range of positive or negative attributes, is presented. The teacher indicates which statements are most descriptive of the class. Examples of statements might look like this:

"This class asks a lot of good questions."

"This class has a lot of trouble learning and they just don't care."

Since teacher perceptions are likely to change as the class becomes more familiar, this scale should be administered a minimum of three times during the year to allow trends to appear.

A student scale provides a third component of the interaction situation. The teacher may be seen as a friendly adult to whom one can turn for assistance, in contrast to a task master who is to be avoided as much as the situation permits. A series of actions which a student may take involving the teacher are presented. The student indicates his likelihood of selecting each action in his present class. At the high school level, specific classes (e.g., English, chemistry) should be randomly assigned to the students enrolled so that each may react to a specific situation. The composite of all student responses will present a picture of the whole school. School data is desired rather than individual data; therefore a tearoff tab indicating both the class and the student should be incorporated to protect the anonymity of both teachers and students.

A rational hypothesis concerning content oriented teaching skills suggests that the ability to formulate appropriate questions and the ability to provide a variety of explanations of concepts are important factors.

A test of these skills has been devised. The data it produces should provide additional documentation of the interaction scene which we believe produces learning. It is therefore included as a necessary component of learning process assessment.*

The final set of interaction data suggested for inclusion in the intensive study is derived from a set of structured group interviews. The school staff is assembled on several occasions and with several configurations of attendance. On each occasion the interviewer presents a topic for discussion, legitimizing in turn, contrasting positions on the topic. Case studies or a series of film clips of classrooms in action are useful stimulators. The content should focus on the degree of understanding and acceptance among the participants.

The group configuration should include administrators on one occasion, teachers only on another, and a variation of teaching responsibility, if staff size permits, on still another occasion. The order of presentation should be rotated among the intensively studied schools to allow order effects to be assessed.

These data collection activities will provide a fix on the teacher's perceptions of activities actually occuring in their classes, their perception of the kind of students they are working with, the students' perceptions of the kind of persons their teachers are, an assessment of the teacher's attitude toward the teaching task. From this set of data, the nature and quality of the student teacher interaction may be inferred, and either qualitatively or categorically described.

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*We are indebted to David Potter, Research Psychologist, Educational Testing Service, for some of the ideas presented here.

Finally, new achievement data is collected from the students of these schools. Variation in the student-teacher interaction data can then be compared with student achievement variation to discover interpretable relations. If the interaction components identified by the several methods of data collection are indeed those which influence the student's learning, several relationships should exist. Because, for example, SES varies with achievement, there should also be a joint variation of interaction components with SES and achievement. Otherwise, the experiences or prerequisites associated with SES which are influencing achievement have not been identified. If, on the other hand, interaction components are identified which vary with achievement but are independent of SES, then a genuine breakthrough may be at hand. Experimental verification is the next step. If the first alternative is true, however, the task becomes that of devising ways to alter the interactions in such a manner that they remain associated with achievement but become independent of SES. This, too, calls for experimentation. It is well to note that the interaction is the crucial factor, not the presence or absence of a certain process, such as style of presentation.

It should also be noted that there is at present very little documented difference between schools in terms of what they do. Therefore, it is quite likely that the modifications of teacher-student interaction patterns will have to be developed and introduced in order to bring about changes in achievement which are independent of the demographic and economic characteristics of schools.

In summary, the correlates of student achievement are useful in two ways. They describe conditions which vary in facilitating student achievement, and help us to focus on areas in which it is fruitful to search for causes of learning difficulty, thus aiding the search.

One final problem remains. Statewide assessment is seen by many as a simplistic solution to the problems of improving quality without the time consuming study proposed here. School reimbursement formulae, district comparisons, legislative critiques are all part of the current picture. The requirements of a good research design are not the only ones to be met. The political requirements may demand that some unwarranted and unwanted components, from a research point of view, must be included as a necessary cost of conducting a meaningful study. The activities suggested here include several which will be deemed unnecessary by some and will be seen as a threat by others. The conditions for successful action must therefore be carefully established. The key principles to be followed in such endeavors are these:

Involve affected groups early and significantly in the planning.

Consistently reject blame placing and direct the available resources toward improvement.

If these principles are genuinely adhered to, the chances of a meaningful contribution to the quality of educational experience are good.

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